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**GHGD** | Ghesha Gostar Dalahoo  
Company





## **Dalahoo Membrane Development Technology**

### **Company Profile**

DMDT Company, the first company that manufactures Reverse Osmosis membranes in Iran, was established in 2012. Regarding raising water demands due to population growth, climate change issue, economic growth, water resources contamination, and water scarcity in the most regions of Iran, offering high-performing ultrafiltration, nanofiltration, and reverse osmosis products can mitigate water crisis. State-of-the-art membranes manufactured by DMDT can be utilized in different sectors, including municipal, industry, power stations, irrigation, and others.

DMDT has developed various RO membranes, including residential, commercial, and industrial that can be used for treatment of brackish water and sea water. The manufactured RO membrane in DMDT are in the shape of flat sheet of thin composite membranes that consist of an active polyamide layer which is supported by a porous polysulphone layer wound round a central collection tube. Production of NF and UF membranes at DMDT will be part of the company development plan in the future.

DMDT operates its manufacturing base in Eyvan Industrial area, Ilam Province, Iran, covering an area of 7 Hectares, with an industrial area of 4,256 square meters. Adhering to the idea of “Fully-automatic Equipment, high-standard production environment and strict quality control, DMDT has set up a fully-automatic membrane sheet producing line and a fully-automatic spiral-winding line with core technologies. The company will, as always, fulfill its social responsibility relying on the well-equipped clean production environment and effluent production in accordance with Iran’s environmental regulations.



## Catalogues of Residential RO Elements

| Model        | Rejection (%) | Ave Permeate (m <sup>3</sup> /day) | Pressure psi (MPa) | Testing Conditions       |              |
|--------------|---------------|------------------------------------|--------------------|--------------------------|--------------|
|              |               |                                    |                    | Concentration NaCl (ppm) | Recovery (%) |
| ULP1812- 50  | 97.5          | 50 (0.19)                          | 60 (0.41)          | 250                      | 15           |
| ULP2012- 100 | 94            | 100 (0.38)                         | 60 (0.41)          | 250                      | 15           |
| ULP3012- 300 | 97            | 300 (1.14)                         | 100 (0.69)         | 500                      | 15           |
| ULP3013- 400 | 95            | 400 (1.52)                         | 100 (0.69)         | 500                      | 15           |

## Catalogues of Commercial Membrane Products

| Type                          | Model       | Permeate Flow |      | Rejection Rate | Active Membrane Area |     | Testing Conditions (Water temperature at 25 C) |      |                                |               |
|-------------------------------|-------------|---------------|------|----------------|----------------------|-----|------------------------------------------------|------|--------------------------------|---------------|
|                               |             | GPD           | m³/d | %              | ft²                  | m²  | Testing Pressure                               |      | Solution Concentration of NaCl | Recovery Rate |
|                               |             |               |      |                |                      |     | Psi                                            | MPa  | mg/L                           | %             |
| Seawater Desalination Element | SW11- 4021  | 750           | 2.8  | 99.5           | 33                   | 3.1 | 800                                            | 5.52 | 32000                          | 4             |
|                               | SW11- 2540  | 600           | 2.3  | 99.5           | 28                   | 2.6 |                                                |      |                                | 8             |
| Ultra Low Pressure Element    | ULP21- 2521 | 300           | 1.13 | 99             | 14                   | 1.3 | 150                                            | 1.03 | 1500                           | 8             |
|                               | ULP21- 2540 | 750           | 2.84 | 99             | 30                   | 2.8 |                                                |      |                                | 15            |

## Catalogues of Industrial RO Membrane Products

| Type                          | Model        | Permeate Flow |      | Rejection Rate | Active Membrane Area |      | Spacer Thickness | Testing Conditions<br>(Water temperature at 25 C) |      |                                |               |
|-------------------------------|--------------|---------------|------|----------------|----------------------|------|------------------|---------------------------------------------------|------|--------------------------------|---------------|
|                               |              | GPD           | m³/d | %              | ft²                  | m²   | mill             | Testing Pressure                                  |      | Solution Concentration of NaCl | Recovery Rate |
|                               |              |               |      |                |                      |      |                  | Psi                                               | MPa  | mg/L                           | %             |
| Seawater Desalination Element | SW8040HR-400 | 7500          | 28.4 | 99.8           | 400                  | 37.2 | 28               | 800                                               | 5.52 | 32000                          | 8             |
| Brackish Water Element        | LP22- 8040   | 10500         | 39.7 | 99.5           | 400                  | 37.2 | 28               | 225                                               | 1.55 | 2000                           | 15            |





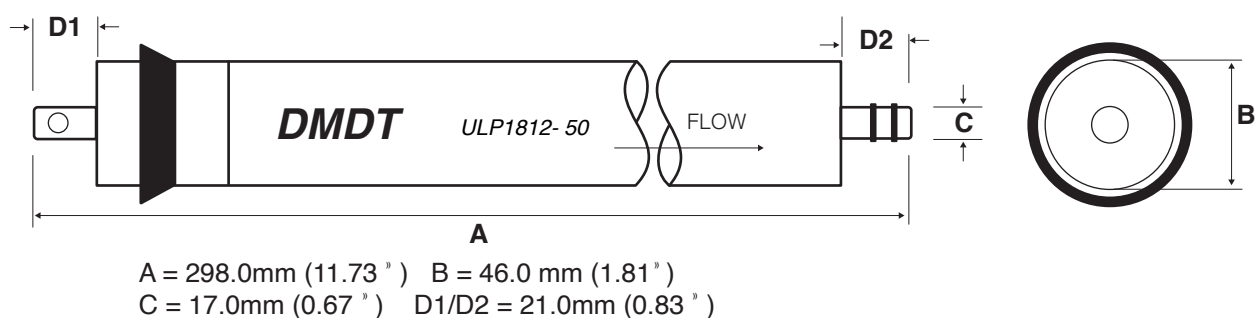
## General Specification of Residential Membrane RO Elements

### 1) RO Element ULP1812- 50

#### Brief Introduction

Independently developed by DMDT, the RO element ULP1812- 50 is designing for treatment of low-salinity water resources such as tap water, well water, etc. Working under extra low pressure, it is applicable to water purifying devices for residence, hospital and laboratory.

#### Dimensions: millimeter (inch)



#### Properties and Testing Conditions

| Model       | Ave Permeate (GPD) | Stable Rejection (%) | Min Rejection (%) |
|-------------|--------------------|----------------------|-------------------|
| ULP1812- 50 | 50                 | 97.5                 | 96                |

Notes: Permeate of single element vary within -20% ~ +20%

#### Testing Conditions

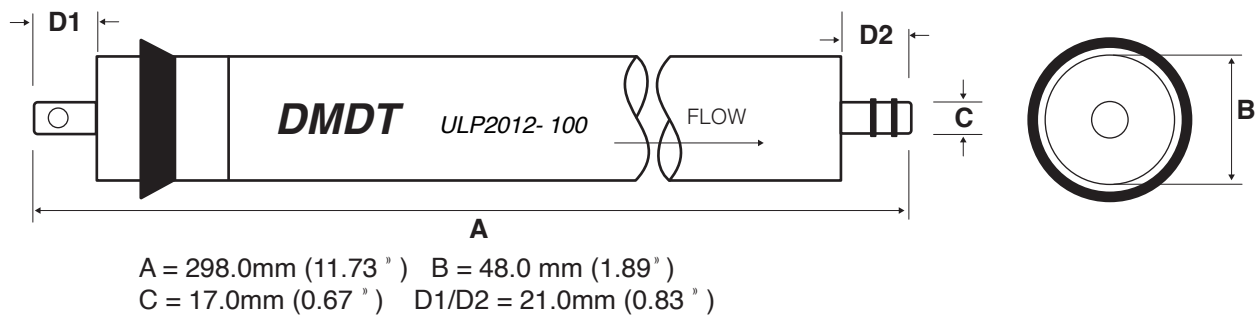
|                                   |                   |
|-----------------------------------|-------------------|
| Testing Pressure                  | 60 psi (0.41 MPa) |
| Temperature of Testing Solution   | 25 °C             |
| Concentration of testing Solution | 250 ppm           |
| PH of testing solution            | 6.5 ~ 8.5         |
| Recovery of single element        | 15%               |

## 2) RO Element ULP2012- 100

### Brief Introduction

Independently developed by DMDT, the RO element ULP2012- 100 is designing for treatment of low-salinity water resources such as tap water, well water, etc. Working under extra low pressure, it is applicable to water purifying devices for residence, hospital and laboratory.

### Dimensions: millimeter (inch)



### Properties and Testing Conditions

| Model        | Ave Permeate (GPD) | Stable Rejection (%) | Min Rejection (%) |
|--------------|--------------------|----------------------|-------------------|
| ULP2012- 100 | 100                | 94                   | 93                |

Notes: Permeate of single element vary within -20% ~ +20%

### Testing Conditions

|                                   |                   |
|-----------------------------------|-------------------|
| Testing Pressure                  | 60 psi (0.41 MPa) |
| Temperature of Testing Solution   | 25 °C             |
| Concentration of testing Solution | 250 ppm           |
| PH of testing solution            | 6.5 ~ 8.5         |
| Recovery of single element        | 15%               |

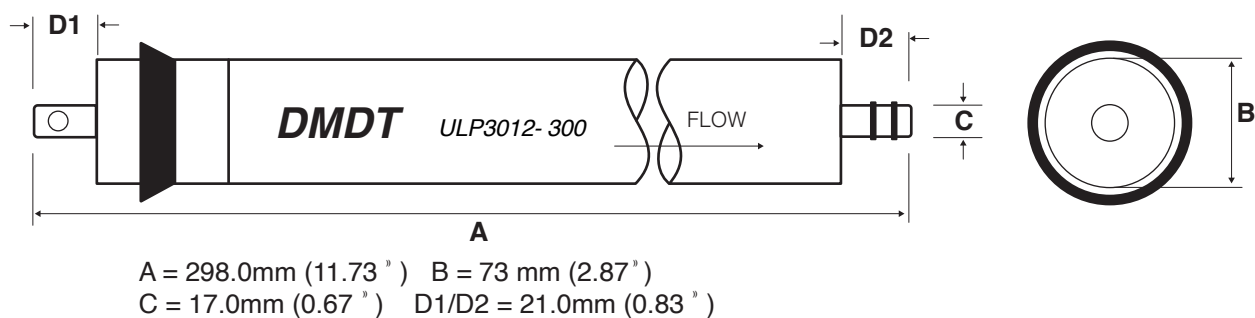


### 3) RO Element ULP3012- 300

#### Brief Introduction

Independently developed by DMDT, the RO element ULP3012- 300 works under extra low pressure and is applicable to automatic water dispenser and residential pure water machine, etc.

#### Dimensions: millimeter (inch)



#### Properties and Testing Conditions

| Model         | Ave Permeate (GPD) | Stable Rejection (%) | Min Rejection (%) |
|---------------|--------------------|----------------------|-------------------|
| ULP3012 - 300 | 300                | 97                   | 96                |

Notes: Permeate of single element vary within -20% ~ +20%

#### Testing Conditions

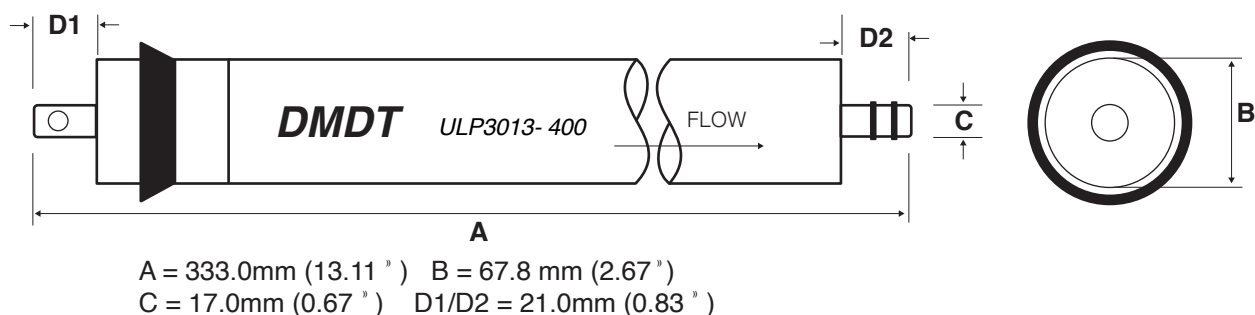
|                                   |                    |
|-----------------------------------|--------------------|
| Testing Pressure                  | 100 psi (0.69 MPa) |
| Temperature of Testing Solution   | 25 °C              |
| Concentration of testing Solution | 500 ppm            |
| PH of testing solution            | 6.5 ~ 8.5          |
| Recovery of single element        | 13% ~ 18%          |

#### 4) RO Element ULP3013- 400

##### Brief Introduction

Independently developed by DMDT, the RO element ULP3013- 400 works under extra low pressure and is applicable to automatic water dispenser and residential pure water machine, etc.

##### Dimensions: millimeter (inch)



##### Properties and Testing Conditions

| Model        | Ave Permeate (GPD) | Stable Rejection (%) | Min Rejection (%) |
|--------------|--------------------|----------------------|-------------------|
| ULP3013- 400 | 400                | 95                   | 94                |

Notes: Permeate of single element vary within -20% ~ +20%

##### Testing Conditions

|                                   |                    |
|-----------------------------------|--------------------|
| Testing Pressure                  | 100 psi (0.69 MPa) |
| Temperature of Testing Solution   | 25 °C              |
| Concentration of testing Solution | 500 ppm            |
| PH of testing solution            | 6.5 ~ 8.5          |
| Recovery of single element        | 15%                |



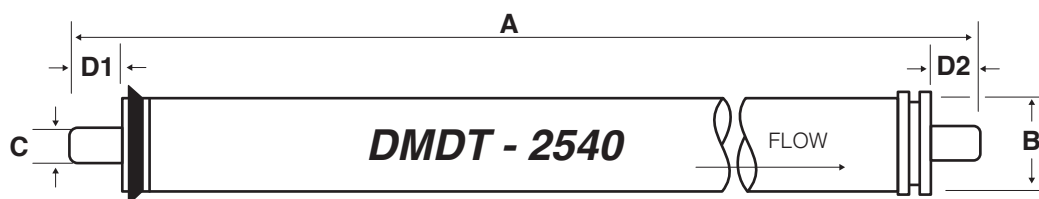
## General Specification of Commercial Membrane RO Elements

### 1) ULP Series of Ultra-low Pressure Membranes

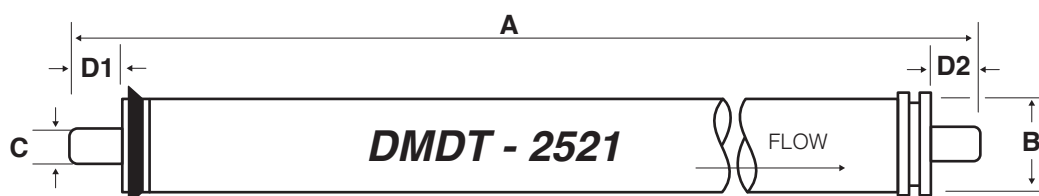
ULP series of ultra-low pressure aromatic polyamide RO element is developed by DMDT for treatment of surface water and underground water. Its operation Pressure is about 2/3 of low pressure membrane, and the rejection rate can reach %99.5. Thus, it can reduce the investment cost of related pumps, pipelines, containers and other equipment and operation cost of RO system, improve economic benefits.

ULP series RO element normally suitable for treatment of surface water, underground water and municipal water with TDS is less than 2000 ppm. It is mainly applied in bottle water, drinking water, boiler replenishment water, food processing and pharmaceutical manufacturing industries and other fields.

| Model                                      | Active Membrane Area ft² (m²)                     | Permeate Flow GPD (m³/day) | Salt Rejection Rate % | Minimum Rejection Rate %                                |
|--------------------------------------------|---------------------------------------------------|----------------------------|-----------------------|---------------------------------------------------------|
| ULP21- 2540                                | 30 (2.8)                                          | 750 (2.84)                 | 99                    | 98.5                                                    |
| ULP21- 2521                                | 14 (1.3)                                          | 300 (1.13)                 | 99                    | 98.5                                                    |
| Testing Condition                          | Testing Pressure 150 psi (1.03 MPa)               |                            |                       |                                                         |
|                                            | Testing solution temperature at 25 °C             |                            |                       |                                                         |
|                                            | Tested at 1500 ppm NaCl solution                  |                            |                       |                                                         |
|                                            | PH value of testing solution 7 ± 0.5              |                            |                       |                                                         |
|                                            | Recovery Rate of single element 15%               |                            |                       |                                                         |
| Operation Limits & Conditions              | Maximum working pressure                          |                            |                       | 600 psi (4.14 MPa)                                      |
|                                            | Maximum volume of feed water                      |                            |                       | 16 gpm (3.6 m3/h)                                       |
|                                            | Maximum feedwater temperature                     |                            |                       | 45 °C                                                   |
|                                            | Maximum feedwater flow SDI15                      |                            |                       | 5                                                       |
|                                            | Residual chlorine concentration of feed water     |                            |                       | < 0.1 ppm                                               |
|                                            | PH rang of feed water during continuous operation |                            |                       | 3 ~ 10                                                  |
|                                            | PH rang of feed water during chemical cleaning    |                            |                       | 2 ~ 12                                                  |
|                                            | Maximum pressure drop per element                 |                            |                       | 15 psi (0.1 MPa) for 2540<br>10 psi (0.07 MPa) for 2521 |
| Size of Membrane Element: 1.0 inch=25.4 mm |                                                   |                            |                       |                                                         |

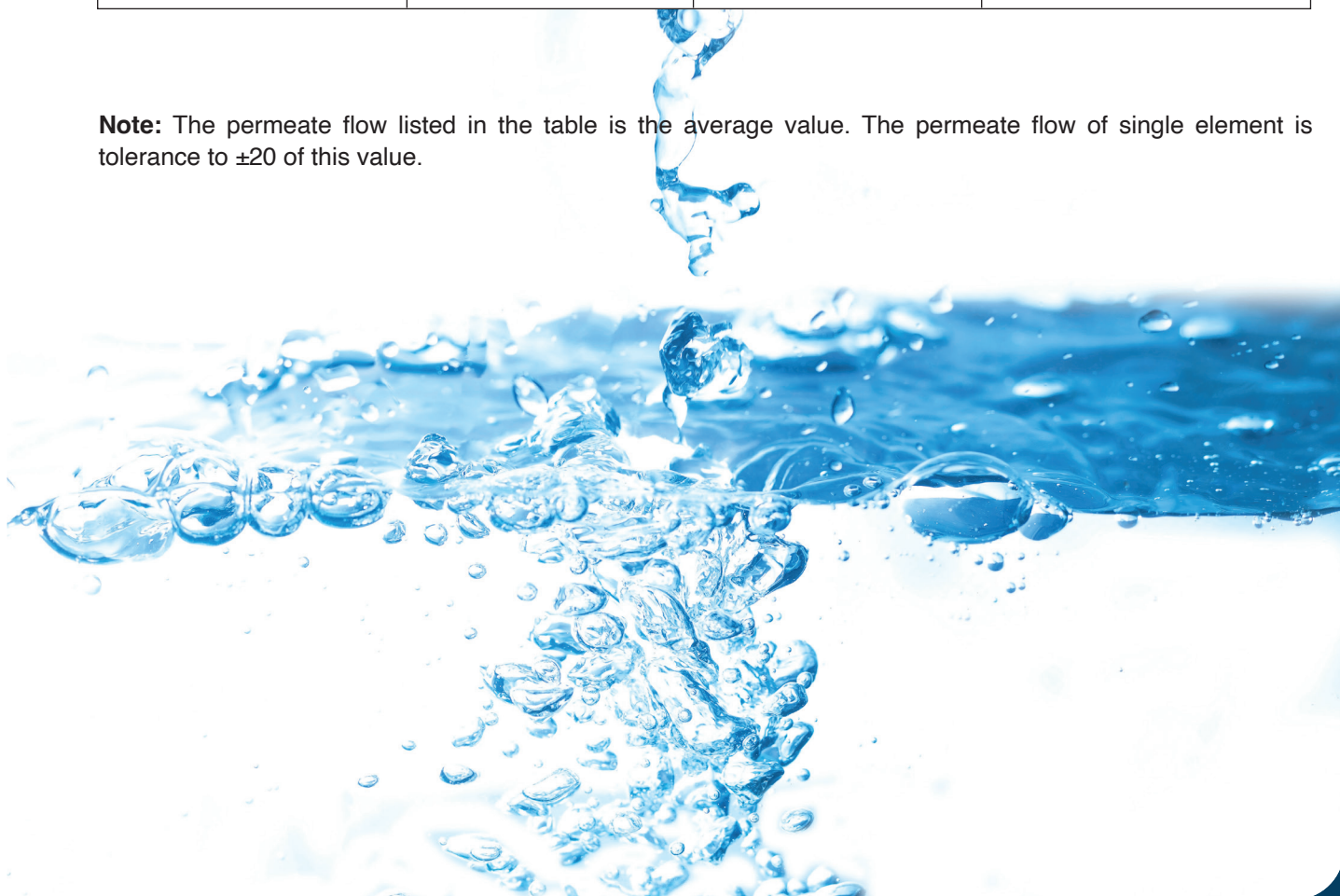


| A/mm (inch) | B/mm (inch) | C/mm (inch) | D/mm (inch) |
|-------------|-------------|-------------|-------------|
| 1016 (40)   | 61 (2.4)    | 19.1 (0.75) | 30.2 (1.19) |



| A/mm (inch) | B/mm (inch) | C/mm (inch) | D/mm (inch) |
|-------------|-------------|-------------|-------------|
| 553.4 (21)  | 61 (2.4)    | 19.1 (0.75) | 30.2 (1.19) |

**Note:** The permeate flow listed in the table is the average value. The permeate flow of single element is tolerance to  $\pm 20$  of this value.



## 2) Commercial SW series of sea water desalination RO element

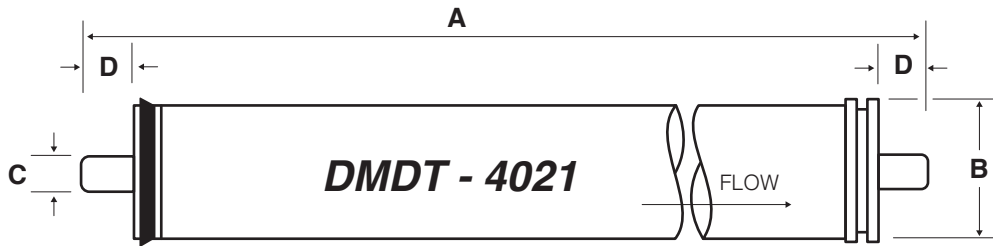
**SW** series of sea water aromatic polyamide RO element developed by DMDT for seawater desalination. This series of elements have the characteristics of low operation pressure, low equipment investment, good desalination performance and stability.

**SW** series membrane elements are generally suitable for the treatment of seawater and brackish water with high concentration. It can be used for seawater desalination, desalination of brackish water with high concentration, boiler replenishment water in power plants, wastewater reuse, concentration and recovery of high value-added substances such as food and pharmaceuticals, etc.

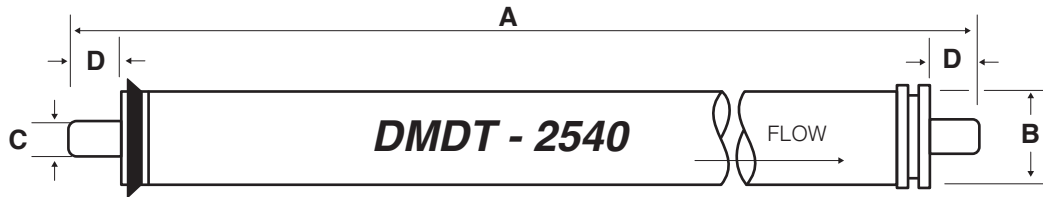
| Model                                      | Active Membrane<br>Area ft² (m²)                           | Permeate Flow<br>GPD (m³/day) | Salt Rejection<br>Rate %                                | Minimum Rejection<br>Rate % |
|--------------------------------------------|------------------------------------------------------------|-------------------------------|---------------------------------------------------------|-----------------------------|
| SW11- 4021                                 | 33 (3.1)                                                   | 750 (2.84)                    | 99.5                                                    | 99.3                        |
| SW11 -2540                                 | 28 (2.6)                                                   | 600 (2.3)                     | 99.5                                                    | 99.3                        |
| Testing Condition                          | Testing Pressure 800 psi (5.52 MPa)                        |                               |                                                         |                             |
|                                            | Testing solution temperature at 25 °C                      |                               |                                                         |                             |
|                                            | Tested at 32000 ppm NaCl solution                          |                               |                                                         |                             |
|                                            | PH value of testing solution 8                             |                               |                                                         |                             |
|                                            | Recovery Rate of single element 4% for 4021<br>8% for 2540 |                               |                                                         |                             |
| Operation Limits<br>& Conditions           | Maximum working pressure                                   |                               | 1200 psi (8.28 MPa)                                     |                             |
|                                            | Maximum volume of feed water                               |                               | 16 gpm (3.6 m3/h) for 4021<br>6 gpm (1.4 m3/h) for 2540 |                             |
|                                            | Maximum feedwater temperature                              |                               | 45 °C                                                   |                             |
|                                            | Maximum feedwater flow SDI <sub>15</sub>                   |                               | 5                                                       |                             |
|                                            | Residual chlorine concentration of feed water              |                               | < 0.1 ppm                                               |                             |
|                                            | PH rang of feed water during continuous operation          |                               | 2 ~ 11                                                  |                             |
|                                            | PH rang of feed water during chemical cleaning             |                               | 1 ~ 13                                                  |                             |
|                                            | Maximum pressure drop per element                          |                               | 15 psi (0.1 MPa)                                        |                             |
| Size of Membrane Element: 1.0 inch=25.4 mm |                                                            |                               |                                                         |                             |



**Size of Membrane Element:** 1.0 inch=25.4 mm



| (A/mm (inch)) | B/mm (inch) | C/mm (inch) | D/mm (inch) |
|---------------|-------------|-------------|-------------|
| 553.4 (21)    | 99.7(3.9)   | 19.1 (0.75) | 26.7(1.05)  |



| (A/mm (inch)) | B/mm (inch) | C/mm (inch) | D/mm (inch) |
|---------------|-------------|-------------|-------------|
| 1016 (40)     | 61(2.4)     | 19.1 (0.75) | 30.2(1.19)  |

**Note:** The permeate flow listed in the table is the average value. The permeate flow of single element is tolerance to  $\pm 20$  of this value.



## General Specification of Industrial RO Elements

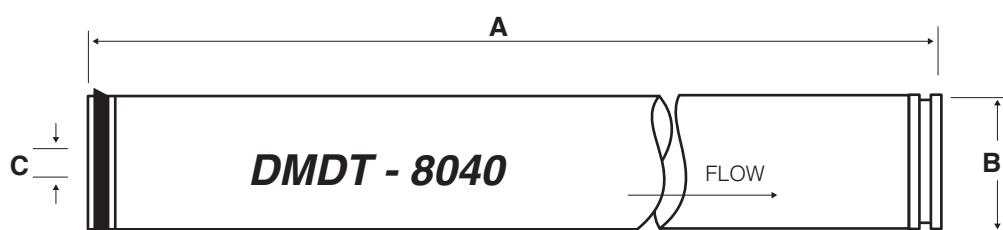
### 1) Seawater Desalination Element: SW8040HR -400

#### Brief Introduction:

SW-8040-400 aromatic polyamide RO element is developed by DMDT for seawater desalination. This series of elements have the characteristics of low operating pressure, low equipment investment, good desalination performance and stability.

This membrane elements are generally suitable for the treatment of seawater and brackish water with high concentration. It can be used for seawater desalination, desalination of brackish water with high concentration, boiler replenishment water in power plants, wastewater reuse, concentration and recovery of high value-added substances such as food and pharmaceuticals, etc.

| Model                                      | Active Membrane Area ft² (m²)               | Permeate Flow GPD (m³/day) | Salt Rejection Rate % | Feed Spacer Thickness mill |
|--------------------------------------------|---------------------------------------------|----------------------------|-----------------------|----------------------------|
| SW-8040- 400                               | 400 (37.2)                                  | 7500 (28.4)                | 99.8                  | 28                         |
| Testing Condition                          | Operating Pressure 800 psi (5.52 MPa)       |                            |                       |                            |
|                                            | Temperature at 25 °C                        |                            |                       |                            |
|                                            | Tested at 32000 mg/L NaCl solution          |                            |                       |                            |
|                                            | PH 8                                        |                            |                       |                            |
|                                            | Recovery Rate at 8%                         |                            |                       |                            |
| Operation Limits & Conditions              | Maximum operating pressure                  |                            |                       | 1200 psi (8.28 MPa)        |
|                                            | Maximum feedwater flow                      |                            |                       | 75 gpm (17 m³/h)           |
|                                            | Maximum feedwater temperature               |                            |                       | 45 °C                      |
|                                            | Maximum feedwater flow SDI <sub>15</sub>    |                            |                       | 5                          |
|                                            | Allowed pH range for feedwater in operation |                            |                       | 2 ~ 11                     |
|                                            | Allowed pH range for chemical cleaning      |                            |                       | 1 ~ 13                     |
|                                            | Maximum concentration of free chlorine      |                            |                       | < 0.1 ppm                  |
|                                            | Maximum pressure drop per element           |                            |                       | 15 psi (0.1 MPa)           |
| Size of Membrane Element: 1.0 inch=25.4 mm |                                             |                            |                       |                            |



| A/mm (inch) | B/mm (inch) | C/mm (inch) |
|-------------|-------------|-------------|
| 1016 (40)   | 201(7.9)    | 29(1.125)   |

### Notice:

1. All data and information provided in this manual have been obtained from long-term experiment by DMDT. We confirm the effective and accuracy of the data. We assume no liability for any consequences of user's failure in abiding the conditions specified in this manual in use or maintenance of membrane products. It is strongly recommended that the user shall strictly abide the designed use and maintenance requirements and keep relevant records.
2. The permeate value listed in the table is the average value. The permeate flow of single membrane element is tolerance not exceeding  $\pm 20\%$  of the nominal value.
3. All wet-type membrane elements have been strictly tested before leaving the factory, and have been treated with 1.0% sodium hydrogen sulfite (10% glycerin antifreeze required in winter) for storage purpose, then sealed with plastic bag in vacuum, and further packed in carton boxes.
4. The membrane used should remain wet after being used; In long term suspension, to prevent the breeding of microbes, soak the membrane elements with protective solution is highly recommended, the solution (prepared with RO filtered water) containing 1.0% sodium hydrogen sulfite (food grade).
5. Operate low pressure flushing for 15-25 minutes of first use, high pressure flushing for 60-90 minutes when first use (Permeate flow no less than 50% of designed flow). Discard all the permeate and concentrated water produced during the first one hour after system start-up.
6. During storage and operation period, it is strictly prohibited to add any chemicals that may be harmful to membrane elements. In case of any violation in adding chemicals, DMDT assumes no liabilities for any damages incurred.
7. Along with technical development and product renovation, all information will be subject to modification without prior notification. Please keep notice of our website for any updates of the product.



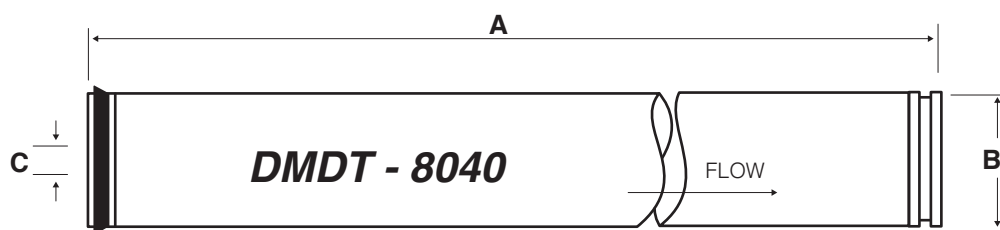
## 2) Brackish Water Element :P22- 8040

### Brief Introduction:

BW-8040 aromatic polyamide RO element is developed by DMDT for treatment of brackish water. It has the characteristics of low-pressure in operation, high permeate flow and excellent rejection performance in removing of solvable salts, TOC, SiO<sub>2</sub>, etc. It is especially suitable for the preparation of high purity water in electronics and power industry.

This membrane is normally suitable for treatment of brackish water, surface water, underground water and municipal water with TDS is less than 10000 ppm. It is mainly used for producing various scales of bottle water, drinking water, industrial used pure water, high purity water, boiler replenishment water, also for wastewater reuse, material concentration, purification and refining purposes.

| Model                                      | Active Membrane Area ft² (m²)               | Permeate Flow GPD (m³/day) | Salt Rejection Rate % | Feed Spacer Thickness mill |
|--------------------------------------------|---------------------------------------------|----------------------------|-----------------------|----------------------------|
| LP22 -8040                                 | 400 (37.2)                                  | 10500 (39.7)               | 99.7                  | 28                         |
| Testing Condition                          | Operating Pressure 225 psi (1.55 MPa)       |                            |                       |                            |
|                                            | Temperature at 25 °C                        |                            |                       |                            |
|                                            | Tested at 2000 mg/L NaCl solution           |                            |                       |                            |
|                                            | PH 7 ± 0.5                                  |                            |                       |                            |
|                                            | Recovery Rate at 15%                        |                            |                       |                            |
| Operation Limits & Conditions              | Maximum operating pressure                  |                            |                       | 600 psi (4.14 MPa)         |
|                                            | Maximum feedwater flow                      |                            |                       | 75 gpm (17 m³/h)           |
|                                            | Maximum feedwater temperature               |                            |                       | 45 °C                      |
|                                            | Maximum feedwater flow SDI <sub>15</sub>    |                            |                       | 5                          |
|                                            | Allowed pH range for feedwater in operation |                            |                       | 2 ~ 11                     |
|                                            | Allowed pH range for chemical cleaning      |                            |                       | 1 ~ 13                     |
|                                            | Maximum concentration of free chlorine      |                            |                       | < 0.1 ppm                  |
|                                            | Maximum pressure drop per element           |                            |                       | 15 psi (0.1 MPa)           |
| Size of Membrane Element: 1.0 inch=25.4 mm |                                             |                            |                       |                            |



| A/mm (inch) | B/mm (inch) | C/mm (inch) |
|-------------|-------------|-------------|
| 1016 (40)   | 201(7.9)    | 29(1.125)   |

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2. The permeate value listed in the table is the average value. The permeate flow of single membrane element is tolerance not exceeding  $\pm 15\%$  of the nominal value.
3. All wet-type membrane elements have been strictly tested before leaving the factory, and have been treated with 1.0% sodium hydrogen sulfite (10% glycerin antifreeze required in winter) for storage purpose, then sealed with plastic bag in vacuum, and further packed in carton boxes.
4. The membrane used should remain wet after being used; In long term suspension, to prevent the breeding of microbes, soak the membrane elements with protective solution is highly recommended, the solution (prepared with RO filtered water) containing 1.0% sodium hydrogen sulfite (food grade).
5. Operate low pressure flushing for 15-25 minutes of first use, high pressure flushing for 60-90 minutes when first use (Permeate flow no less than 50% of designed flow). Discard all the permeate and concentrated water produced during the first one hour after system start-up.
6. During storage and operation period, it is strictly prohibited to add any chemicals that may be harmful to membrane elements. In case of any violation in adding chemicals, DMDT assumes no liabilities for any damages incurred.
7. Along with technical development and product renovation, all information will be subject to modification without prior notification. Please keep notice of our website for any updates of the product.